Femtech Data Privacy post-*Dobbs*: A Preliminary Analysis of User Reactions

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ABSTRACT

Femtech entails a growing category of digital tools and services—including mobile apps, wearables, and internet-connected devices—designed to help women track their personal, reproductive, and sexual health. Entrusted by millions of users to track menstrual cycles, ovulation windows, and plan or prevent pregnancies, these apps collect large amounts of deeply personal data. In the U.S., femtech—and how it collects, stores, and discloses data—is largely unregulated, and users are left to trust the policies and promises made by femtech providers to protect their privacy. In light of the recent U.S. Supreme Court decision overturning the constitutional right to abortion, many femtech users are now worried that their personal health data could be used against them in criminal and civil proceedings. In this poster, we provide preliminary findings of whether user concerns over data privacy have changed since the *Dobbs* decision in June 2022, through a thematic and sentiment analysis of user reviews of femtech apps in the Apple App Store and the Google Play Store. We then point to ways femtech platforms could address such concerns through privacy-by-design and changes to privacy policies.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in ubiquitous and mobile computing**; • **Security and privacy** → **Privacy protections**.

KEYWORDS

Femtech, Privacy, Mobile applications, User review analysis

1 INTRODUCTION

Femtech is a growing domain of digital tools, products, services, wearables, and software that use technology to help address women's

health issues, including menstrual health, reproductive health, sexual health, maternal health, and menopause [21]. The global femtech market size was valued at $5.1 billion in 2021 and is expected to expand at a Compound Annual Growth Rate of 11.1% from 2022 to 2023 [1]. Femtech companies provide an opportunity for women to take charge of their health and any health-related data. Yet, the digitization of the reproductive body, which includes self-tracking apps and IoT devices that collect extremely sensitive data, can also put users at risk and harm, such as tracking abortion or infertility [3]. Mobile applications, especially in femtech, have seen unprecedented growth and raised many privacy concerns. Almost all femtech developers collect and use highly personal and sensitive user data, beyond the expected functionalities of the apps themselves [7]. This increases the need for security and privacy policies even more. Although mobile platforms, such as Android and iOS, provide privacy permission interfaces to show what data/functionality each app may use, sufficient explanations on how and why certain data is used are absent [27]. The collected data is usually shared with third-party data aggregators for targeted advertising which is a common issue. However, when it comes to femtech data, the problem is more pronounced due to its sensitive nature [7]. It is imperative to conduct this research because users lack an understanding of the privacy policies in mobile applications. Understanding the positive and negative emotional aspects around engaging with self-tracking data and activities is critical in the context of health because users' experiences affect 1) their mental and physical health, 2) their self-tracking practices, and 3) their commitment to self-tracking activities [5].

Understanding femtech users' awareness and perspectives regarding data privacy takes on even greater importance given the U.S. Supreme Court's landmark *Dobbs v. Jackson* decision stated that the Constitution of the United States does not confer the right to abortion, effectively overturning *Roe v. Wade*. In the wake of *Dobbs*, concerns quickly emerged that the data collected by femtech apps used to track reproductive health, menstrual cycles, and fertility could be weaponized to target women faced with the rise of newly restrictive abortion laws in many states. Concerns about digital tracking have grown as consumers abandon their femtech apps for better privacy [10]. The abandonment of femtech apps is due to the possibility of the data becoming a target for subpoenas or court orders [4]. There are multiple ways data can be obtained by law enforcement- it can come directly from the mobile device and applications, through third parties, through femtech companies, or through a breach or cyberattack. This is not just a possibility, in January 2021, Federal Trade Commission ordered Flo Health, the company behind the popular "Flo Period Tracker" app to notify their users that their data was shared with marketing services like Google and Facebook [18]. Even though there are laws such as

Health Insurance Portability and Accountability Act (HIPAA), there are no similar laws that protect data in any period or pregnancy tacking app [25]. They not only can take the app's data but also the location of the user to link them to abortion clinics. In light of this, "Clue," another femtech company has issued a lengthy statement stating that it is safe under the European GDPR law that applies special protection to user's health data [20]. Post-*Dobbs*, many apps have enabled the incognito mode but even then the information is not secure, because it can be linked back to the user through the app's data [11].

Our research provides a preliminary analysis of the data privacy concerns expressed by users of femtech. We seek to understand the broad topics and themes that emerge in user reviews of popular femtech apps, with particular attention to issues of data privacy and security that might arise. Specifically, we compare user reviews pre- and post-*Dobbs* to assess if any mention of data privacy differs across those two periods. Our project is guided by the following research questions:

RQ1: What are the overall topics expressed in femtech user reviews, and how have these changed over time?

RQ2: What issues around data privacy are expressed in femtech user reviews, and are these positive or negative sentiments?

RQ3: Are there any significant changes in femtech user reviews after the *Dobbs* decision?

This work is part of a broader, comprehensive study of the femtech ecosystem to assess a range of data privacy practices, threats, and experiences of users. The results will guide recommendations for the femtech community to engage in privacy-by-design and take additional steps to engage in privacy-protecting practices.

2 RELATED WORK

Research on app usage for tracking women's health has been increasing, including studies focused on fertility[5, 16, 24] and menstruation tracking apps[9, 14–16, 23, 24, 26]. Recent investigations reveal that femtech apps have misled users about their privacy policies and left users vulnerable to security threats with no consent [22]. Other studies have explored how app developers deal with the data collection and the information they provide to users [23]. The results identified that apps had policies that covered the services but sometimes had no relation to the app at all. This increases the uncertainty of how the app works with your data. Other research has explored the perceived advantages of fertility and menstruation tracking apps, while also making visible what data is shared through these apps with third parties [24]. This study calls for rethinking tools that are meant to solve issues but are rather a market of data that is shared without consent.

Other research has explored how user emotions correlate with self-tracking culture, broadly suggesting users' experiences range from feeling positive, burned, obsessive, trapped, and abandoned [5]. Similar studies have been conducted in mental health applications in which they found that there is a lack of attention in these apps to offer real-time and emergency support, as well as a lack of transparency in collecting private data from users [12]. Researchers have evaluated mental health apps using several methods to understand the shortcomings of the apps [19]. They have also identified the users' willingness to have their mobile phone used as

an experimental assessment tool for their mental health disorders and give consent to share their data [6].

Specific to our methodology, research utilizing user reviews has become an important way of understanding users' expectations, any advantages, and gaps that can be identified by the developers [13].

3 METHODS

We will use a mixed-method approach to analyze user reviews and understand user perceptions of femtech apps. In similar studies with analysis of user reviews, researchers have used an open-source Google Play API which granted them a large-scale dataset from Google Play Store [8]. Another study has used the iTunes App Store and the Google Play Store review scrapers to retrieve user reviews [2]. Our methodology will follow the same process as the previous study [2] with the usage of unique Python libraries.

3.1 Data Collection

We will assemble a list of femtech apps through a keyword search on the Apple App Store and Google Play store using relevant search terms such as "femtech", "menstrual tracking", "fertility", "ovulation tracker", "menstrual cycle calendar", and "women's sexual health". The initial inclusion criteria are that the app must have an English language interface and must have at least 1000 downloads. Custom Python scripts will be used to scrape app details and any user reviews that are available on the app stores. Reviews will be collected through May 1, 2023, and only reviews of 150 characters or more will be captured for analysis. Any identifiable information will be removed from the data collected.

3.2 Data Analysis

Reviews will be initially categorized as negative, neutral, or positive based on the number of star ratings for the app, and additional automated sentiment analysis will be performed to fine-tune each review's overall opinion of the app. Topic modeling will then be used to further categorize themes within reviews, whether the text discussed functionality, usability, or data privacy. Reviews identified with discussions of data privacy will be further analyzed qualitatively to gain a deeper understanding of the issues brought to light by the user.

4 POTENTIAL RESULTS

Data collection is underway and will be completed by the end of summer 2023. Our sentiment and thematic analysis of the overall topics expressed in femtech user reviews will be presented temporally to assess any changes that have happened over time, including post-*Dobbs*. We will provide a detailed qualitative analysis of user reviews related to data privacy, and construct recommendations for femtech app developers to address any privacy concerns conveyed.

Overall, our findings can help generate attention and recommendations on how the femtech industry can change and cater to people in ethically-informed ways.

5 FUTURE WORK

At the conclusion of this project, we will further analyze data privacy dimensions of femtech apps through the lens of a user by using

the "walkthrough method." The walkthrough method is a way of engaging directly with an app's interface to examine its technological mechanisms and embedded cultural references to understand how it guides users and shapes their experiences and understandings of an app [17]. This future work will help us understand and analyze how popular femtech apps frame data collection and privacy for new users, further enhancing our ability to make policy and design recommendations.

REFERENCES

[1] [n. d.]. Femtech Market Size, Share & Trends Analysis Report By Product Type (Wearable, Mobile Apps), By Region, and Segment Forecasts, 2022 - 2030. https://www.grandviewresearch.com/industry-analysis/femtech-market-report

[2] Mohamed Ali, Mona Erfani Joorabchi, and Ali Mesbah. 2017. Same app, different app stores: A comparative study. In *2017 IEEE/ACM 4th International Conference on Mobile Software Engineering and Systems (MOBILESoft)*. IEEE, 79–90.

[3] Teresa Almeida, Laura Shipp, Maryam Mehrnezhad, and Ehsan Toreini. 2022. Bodies Like Yours: Enquiring Data Privacy in FemTech. In *Adjunct Proceedings of the 2022 Nordic Human-Computer Interaction Conference* (Aarhus, Denmark) *(NordiCHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 54, 5 pages. https://doi.org/10.1145/3547522.3547674

[4] Karen Blum. 2022. Impact of expected Roe v. Wade reversal on tele-health and Femtech providers. https://healthjournalism.org/blog/2022/06/impact-of-expected-roe-v-wade-reversal-on-telehealth-and-femtech-providers/

[5] Mayara Costa Figueiredo, Clara Caldeira, Elizabeth Victoria Eikey, Melissa Mazmanian, and Yunan Chen. 2018. Engaging with Health Data: The Interplay Between Self-Tracking Activities and Emotions in Fertility Struggles. *Proc. ACM Hum.-Comput. Interact.* 2, CSCW, Article 40 (nov 2018), 20 pages. https://doi.org/10.1145/3274309

[6] Daniel Di Matteo, Alexa Fine, Kathryn Fotinos, Jonathan Rose, Martin Katzman, et al. 2018. Patient willingness to consent to mobile phone data collection for mental health apps: structured questionnaire. *JMIR mental health* 5, 3 (2018), e9539.

[7] Jacob Erickson, Jewel Y. Yuzon, and Tamara Bonaci. 2022. What You Do Not Expect When You Are Expecting: Privacy Analysis of Femtech. *IEEE Transactions on Technology and Society* 3, 2 (2022), 121–131. https://doi.org/10.1109/TTS.2022.3160928

[8] Bin Fu, Jialiu Lin, Lei Li, Christos Faloutsos, Jason Hong, and Norman Sadeh. 2013. Why people hate your app: Making sense of user feedback in a mobile app store. In *Proceedings of the 19th ACM SIGKDD international conference on Knowledge discovery and data mining*. 1276–1284.

[9] Michele Estrin Gilman. 2021. Periods for profit and the rise of menstrual surveillance. *Colum. J. Gender & L.* 41 (2021), 100.

[10] Anastassia Gliadkovskaya. 2022. Consumer demand for more digital security is up post-Roe. can Femtech deliver on it? https://www.fiercehealthcare.com/health-tech/experts-question-femtech-apps-claims-privacy-post-roe

[11] Sara Youngblood Gregory. 2022. Should you delete your period-tracking app? A brief guide to protecting your privacy in a post-'roe' world. https://www.cosmopolitan.com/lifestyle/a40667518/period-apps-privacy-roe-v-wade/

[12] Md Romael Haque and Sabirat Rubya. 2022. "For an App Supposed to Make Its Users Feel Better, It Sure is a Joke" - An Analysis of User Reviews of Mobile Mental Health Applications. *Proc. ACM Hum.-Comput. Interact.* 6, CSCW2, Article 421 (nov 2022), 29 pages. https://doi.org/10.1145/3555146

[13] Jasmin Haunschild and Christian Reuter. 2021. Bridging from Crisis to Everyday Life – An Analysis of User Reviews of the Warning App NINA and the COVID-19 Regulation Apps CoroBuddy and DarfIchDas. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) *(CSCW '21)*. Association for Computing Machinery, New York, NY, USA, 72–78. https://doi.org/10.1145/3462204.3481745

[14] Bryndl Hohmann-Marriott. 2021. Periods as powerful data: User understandings of menstrual app data and information. *New Media & Society* (2021), 14614448211040245.

[15] Siyeon Ko, Jisan Lee, Doyeon An, Hyekyung Woo, et al. 2023. Menstrual Tracking Mobile App Review by Consumers and Health Care Providers: Quality Evaluations Study. *JMIR mHealth and uHealth* 11, 1 (2023), e40921.

[16] Maria Kovacova, Jakub Horak, and Adela-Claudia Cuţitoi. 2022. Menstrual Tracking Apps, Fertility Algorithms, and Intimate Behavior Data. *Journal of Research in Gender Studies* 12, 1 (2022), 9–23.

[17] Ben Light, Jean Burgess, and Stefanie Duguay. 2018. The walkthrough method: An approach to the study of apps. *New media & society* 20, 3 (2018), 881–900.

[18] Julia Logue. 2022. Users of "Femtech" should be concerned-in a post-Dobbs world, their personal data could be used against them. https://georgetownlawtechreview.org/users-of-femtech-should-be-concerned-in-a-post-dobbs-world-their-personal-data-could-be-used-against-them/GLTR-11-2022/

[19] Oladapo Oyebode, Felwah Alqahtani, and Rita Orji. 2020. Using machine learning and thematic analysis methods to evaluate mental health apps based on user reviews. *IEEE Access* 8 (2020), 111141–111158.

[20] Sarah Perez. 2022. Consumers swap period tracking apps after Roe v. Wade ruling. https://techcrunch.com/2022/06/27/consumers-swap-period-tracking-apps-in-search-of-increased-privacy-following-roe-v-wade-ruling/

[21] Linda Rosencrance. 2022. What is Femtech? https://www.techtarget.com/whatis/definition/femtech

[22] Allysan Scatterday. 2021. This is No Ovary-Action: Femtech Apps Need Stronger Regulations to Protect Data and Advance Public Health Goals. *NCJL & Tech.* 23 (2021), 636.

[23] Laura Shipp and Jorge Blasco. 2020. How private is your period?: A systematic analysis of menstrual app privacy policies. *Proc. Priv. Enhancing Technol.* 2020, 4 (2020), 491–510.

[24] Anastasia Siapka and Elisabetta Biasin. 2021. Bleeding data: the case of fertility and menstruation tracking apps. *Internet Policy Review* 10, 4 (2021), 1–34.

[25] Katie Leslie Susan Hogan. 2022. Why the overturning of Roe v. Wade has some women deleting fertility apps. https://techcrunch.com/news/consumer/why-the-overturning-of-roe-v-wade-has-some-women-deleting-fertility-apps/3142328/

[26] Anupriya Tuli, Surbhi Singh, Rikita Narula, Neha Kumar, and Pushpendra Singh. 2022. Rethinking Menstrual Trackers Towards Period-Positive Ecologies. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*. 1–20.

[27] Bo Zhang and Heng Xu. 2016. Privacy Nudges for Mobile Applications: Effects on the Creepiness Emotion and Privacy Attitudes. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (San Francisco, California, USA) *(CSCW '16)*. Association for Computing Machinery, New York, NY, USA, 1676–1690. https://doi.org/10.1145/2818048.2820073